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ABSTRACT

This paper is concerned with the application of market research techniques to segment large populations into homogeneous units in order to improve the reach, utilization, and effectiveness of health programs. The paper identifies seven distinctive patterns of health attitudes, social influences, and behaviors using cluster analytic techniques in a sample drawn from four California cities (N=2,504). The paper finds that these lifestyle clusters predict associated behaviors, including seatbelt use, vitamin use, and attention to health information, with higher means for health-oriented clusters in each case. Furthermore, the paper finds that the clusters predict self-reported improvements in health behavior--e.g., eating less salt and losing weight--and self-reported new exercise as measured in a two-year follow-up, with higher means again found, with two exceptions, for health-related clusters. Implications for public health education and intervention efforts, and future research directions are discussed. Four tables of data and eight notes are included, and 17 references are attached. (Author/SR)

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Health Lifestyles: Audience Segmentation Analysis for Public Health Interventions[1]

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Health Lifestyles: Audience Segmentation Analysis for Public Health Interventions

Abstract

This paper is concerned with the application of market research techniques to segment large populations into homogeneous units in order to improve the reach, utilization, and effectiveness of health programs. Seven distinctive patterns of health attitudes, social influences, and behaviors are identified using cluster analytic techniques in a sample drawn from four California cities (N=2504). These lifestyle clusters predict associated behaviors, including seatbelt use, vitamin use, and attention to health information, with higher means for health-oriented clusters in each case. The clusters also predict self-reported improvements in health behavior--e.g., eating less salt and losing weight--and self-reported new exercise as measured in a two-year follow-up, with higher means again found, with two exceptions, for health-related clusters. Implications for public health education and intervention efforts, and future research directions, are discussed.

Health Lifestyles: Audience Segmentation Analysis for Public Health Interventions

Social marketing principles have been proposed as guidelines that can improve the effectiveness of public health interventions. Many of the principles of social marketing have been derived from commercial marketing and advertising, but have been modified to pertain to encouraging change of lifestyle behaviors (Kotler & Zaltman, 1971). These principles include segmentation of the target audience into homogeneous units, analysis of relevant knowledge, attitudes, social norms, and behaviors of each segment, identifying communication channels most appropriate for each segment, developing message/intervention strategies responsive to the norms, attitudes, and behaviors of each segment, and pretesting materials or programs with groups from each segment (Lefebvre & Flora, 1988). This paper is concerned with the first of these principles: segmenting target populations into homogeneous groups. While segmentation is common in product marketing and advertising, little attention has been paid to developing segmentation strategies that might improve the reach, utilization, and effectiveness of health interventions.

Large populations are typically segmented by demographic variables--socioeconomic status, age, gender, education--for the purpose of describing or predicting health behaviors. However, health attitudes and behaviors are not consistently related to demographics (e.g. Lau, Hartman, & Ware, 1986). In addition, demographic breakdowns rarely give the intervention planner an understanding of the various personal and social contexts in which health behavior takes place. The research reported here

applies an alternative segmentation technique, lifestyle analysis, to public health concerns. Lifestyle analysis is a multivariate clustering technique commonly used by market researchers to identify subpopulations sharing similiar patterns of social norms, beliefs, and behaviors (Mitchell, 1983; Weinstein, 1987; Wells, 1974). Lifestyle analyses, however, have seldom been applied in the public health field.

We hypothesize that lifestyle patterns can be identified that will predict associated health-related behaviors and changes in subsequent health behaviors, demonstrating construct and predictive validity. The most important use of these lifestyle patterns may not be for their ability to predict health behaviors, but for the insight they provide in guiding the design of health interventions.

Methods

Data and variables used in the analysis. The data used in this analysis were from the Stanford Five City Project (FCP). The FCP data set at present consists of four waves of behavioral and physiological data collected over an eight year period in four central California cities (archival data only is monitored in the fifth city). Two cities have been the site of an extensive health promotion campaign during the time studied. Data used in this study were collected from a panel of subjects randomly selected from household directories (Farquhar et al., 1985). Demographic characteristics of the full sample are summarized

in Table 1.

Table 1 about here

A literature review was conducted to identify variables found to influence health behaviors from a variety of research perspectives, including the Health Belief Model (Maiman & Becker, 1974), the theory of reasoned action (Fishbein & Ajzen, 1975), and social learning theory (Bandura, 1986). Indicators for most of those variables were located in the FCP survey instrument, an hour-and-a-half long interviewer-administered questionnaire.[3] A total of 10 cognitive/attitudinal variables, three social influence variables, five behavioral variables, and seven demographic variables were included in the overall model. Some variables were operationalized using indices, some with single items. Indices were deemed acceptably reliable with Cronbach alpha coefficients of .60 or better. This is a commonly used threshold in survey research for indices constructed post hoc in course of data analysis, in which the number of items in each index may be small, or the items available to operationalize a variable may be adequately but not optimally reliable.

1) Knowledge. A 17-item true-false and multiple choice test was used to assess health knowledge.[4] The Cronbach's alpha for the internal consistency of this index was .73.

2) Other attitudinal/cognitive variables.. There was a single item measure concerning the relationship between weight and heart disease. An index assessed beliefs about the palatability and affordability of healthier foods (Cronbach's alpha=.60). Individual items assessed perceived risk, concern about personal health status, involvement with heart disease as an issue, and willingness to change health habits. Awareness of the preventability of cardiovascular disease was measured by

summing the number of correct responses to an open-ended question concerning what a person could do to keep from having a heart attack or stroke. Self-efficacy with respect to managing diet habits was measured using a nine-item index assessing confidence in carrying out healthful diet-related behaviors (Cronbach's alpha=.94), and self-efficacy with respect to undertaking exercise was measured using a comparable four-item index (Cronbach's alpha=.90).

3) Social influences. Single items measured family and peer norms with regard to diet. A four-item index was used to measure discussion of health issues (Cronbach's alpha=.60).

4) Health behaviors. The health behaviors were analyzed using self-report scales for dietary habits, low- and high-level exercise, smoking, and alcohol consumption. Dietary habits were measured using a nine-item index which included measures of control of intake of salt and saturated fats, self-monitoring of diet, and weight control habits (Cronbach's alpha=.63). A measure of low-level exercise was created by summing positive responses to a list of activities involving walking and climbing stairs. Vigorous exercise was assessed by summing positive responses to a list of strenuous aerobic activities (e.g., jogging, swimming, strenuous racket sports). Respondents were coded as smokers if they reported smoking one or more cigarettes on a typical day. Alcohol use was assessed using a single item concerning frequency of consuming alcoholic beverages.

5) Demographic variables. Demographic variables included age, gender, years of education, income, race, marital status, and household size.

Computation of lifestyle clusters. The variables were analyzed using the SAS Fastclus k-means procedure to create clusters in multi-dimensional space, and to define group membership for each subject (SAS, 1985). Cluster analytic techniques such as the k-means procedure are conceptually similar to Q-factor analysis, or the grouping of individual observations across variables rather than the grouping of variables across observations as in standard factor analysis. To maximize the power of the iterative procedure, a first run was made through the data to create clusters, the means of which were then used as the starting points for a second run. Nine clusters were specified, based on the marketing heuristic that typologies much larger than nine are too cumbersome to use effectively in campaign planning (Mitchell, 1983). All indices and continuous variables were standardized. Dichotomous variables were recoded to eliminate spurious elevations in comparison with z-scores.

Validation and outcome variables. The most appropriate way to validate clusters is to test construct and predictive validity (Aldenderfer & Blashfield, 1984; Finney & Moos, 1979; Hartigan, 1975; SAS, 1985).[5] Construct and predictive validity may tested statistically, by using cluster membership as a predictor of theoretically-related criterion variables.

Seatbelt use, use of vitamins, and attention to health information are used to test construct validity. These variables were selected because a) they had a plausible theoretical relationship with the concept of health lifestyle behavior as discussed below, b) they represented distinctively different behaviors than those used to generate the clusters, so that the validation would not

be due to tautological relationships, and c) there were items available to operationalize the variables in this data set.

One-way analyses of variance test cluster membership as a predictor of seatbelt use, vitamin use, and attention to health information. Linear contrasts are used to test whether or not the means for apparently health-oriented clusters are higher than for non-health oriented clusters. Higher means for health-oriented clusters should be expected given research findings linking seatbelt use to other preventive health behaviors (Langlie, 1979; Mechanic & Cleary, 1980). Higher levels of Vitamin C use might also be expected among health-oriented clusters despite its questionable health merit, given the popular publicity given to Vitamin C as a possible preventative for viral infections. Greater attention to health information should be expected from health-oriented clusters, given that media audiences tend to seek out information of interest (Donahew & Tipton, 1973).

Predictive validity is examined using one-way analyses of variance to test whether or not cluster membership predicts self-reported change in health behaviors and self-reported exercise change two years after the baseline survey. Self-reported behavior and exercise change were chosen for several reasons. Predictive validity is based on the ability of a variable to predict theoretically related outcomes at a future point in time. The self-reported change variables met this criteria best, of the variables available in the survey instrument: Difference scores based on behavioral variables in the algorithm that generated the clusters would have been highly predictive based simply on regression to the mean.

Mean changes for apparently health-oriented clusters versus non-health oriented clusters are tested. Presumably, persons with health-oriented values, social influences, and behaviors would be more likely to initiate healthful behavior changes than those who are less health-oriented. A multivariate analysis of variance is conducted to assess overall impact, providing a single overall significance test for the predictive power of the clusters and for the contrasts.

1) Seatbelt use. Seatbelt use is measured with a single item concerning frequency of seatbelt use.

2) Vitamin C use. Vitamin C use is measured with a single item concerning frequency of taking Vitamin C.

3) Attention to health information. Attention to health information is measured using a four-item index with a Cronbach's alpha of .70.

4) Self-reported exercise change. Two measures were created from a single item asking respondents what new forms of exercise they had adopted in the past two years. The item provided 20 response categories of commonplace forms of exercise and allowed for additional types of responses. Up to three new activities were coded, along with whether or not the activity was enacted for at least 20 minutes, three times a week. The response categories were separated into moderate and vigorous physical activity, and scales created by summing the number of new activities of each kind adopted by the respondent. An additional point on the scale was added for each activity engaged in three or more times a week for 20 minutes each time.

5) Self-reported changes to improve health. One item,

concerning changes made to improve health over the two years since the baseline survey--e.g., eating less red meat, using less salt, losing weight--was used to assess health behavior change. Responses--up to 11 responses were coded--were summed to create a scale of self-reported health behavior changes.

Results

Lifestyle patterns identified. The analysis identified seven lifestyle patterns--two clusters, of one person each, were dropped as outliers from the original nine specified. The seven lifestyle patterns, or clusters, are summarized in Tables 2 and 3. Clusters that are somewhat similar demographically but that have contrasting health orientations--e.g., Healthful Adults and Unhealthful Adults--are grouped within the same table to facilitate comparison. Descriptive labels are attached to each cluster to facilitate discussion.

Tables 2 and 3 about here

Distinguishing characteristics of each cluster are indicated by high or low z-scores. For example, the Unhealthful Adults are very heavy smokers and drinkers compared to the sample as a whole, and have relatively unhealthful diet habits. A more complete profile of the group is obtained when one looks at the attitudinal variables that do and do not characterize the group: The Unhealthful Adults do recognize that they are at risk, but are not especially concerned about their health, and report that they are unwilling to change their habits for the sake of their health.

Key characteristics of each cluster, and some implications for health interventions, are reviewed in the discussion section.

Cluster validation. A multivariate analysis of variance was conducted using seatbelt use, vitamin C use, attention to health information in the media, new vigorous exercise, new moderate exercise, and self-reported new health maintenance behaviors as the dependent variables. The Wilk's lambda for the overall effect was statistically significant ($F(36,7003)=6.93$, $p<.0001$).[6] One-way ANOVAs indicated similar levels of significance for each individual criterion variable (see Table 4).[7]

Table 4 about here

Contrasts were made to test construct validity. Healthful Adults, Healthful Young Adults, Healthful Talkers, and Young Athletes were grouped as health-oriented clusters, and Unhealthful Adults, Unhealthful Young Adults, and Worried Older Adults were grouped as non-health oriented clusters. Means for the health-oriented clusters were hypothesized to be higher for each of the criterion variables. Contrasts were also carried out comparing the two pairs of groups which were somewhat comparable demographically but were distinct in terms of health orientation: Healthful versus Unhealthful Adults, and Healthful versus Unhealthful Young Adults.

All three contrasts were significant at the .0001 level using MANOVA. In the analyses of the individual criterion variables, the health orientation contrast was significant at the .001 level or better for all variables except moderate exercise, which was significant at .05. The Healthful versus the Unhealthful Adults and the Healthful versus Unhealthful Young

Adults contrasts were significant in all but two cases, for self-reported new moderate and vigorous exercise. Differences between groups for all contrasts were in the predicted direction. F-ratios and significance levels for all contrasts are reported in Table 4.

Discussion

The lifestyle clusters proved effective predictors of health behavior and behavior change variables. The only exceptions were that membership in Healthful or Unhealthful Adult clusters, and Healthful or Unhealthful Young Adults clusters, did not significantly predict self-reported new exercise. This may have been a consequence of several factors. The younger clusters tended to have a relatively high level of exercise regardless of health orientation, perhaps washing out group differences--especially as the Unhealthful Young Adults were on average four years younger than the Healthful Young Adults. The Unhealthful Adults were on the average over 10 years younger than the Healthful Adults and had proportionally more males. These demographic differences may have counterbalanced health orientation with respect to adoption of new exercise among the older adults.

The lifestyle patterns identified in this study pose opportunities and challenges to the health professional planning education or intervention efforts. Three of the clusters--Unhealthful Adults, Unhealthful Young Adults, and Worried Older Adults--seem particularly high-priority candidates for such efforts, given the relatively high occurrence of unhealthy behaviors among them. The patterns of beliefs, attitudes, and behaviors are different for each cluster, suggesting that

somewhat different education or intervention strategies might be appropriate in each case. For example, the Worried Older Adults think about cardiovascular health, are worried about their health status, but are relatively ignorant of ways in which they may reduce their risk of heart disease and lack confidence in their ability to change at least some health maintenance behaviors. Education and intervention efforts aimed at increasing awareness about how to reduce health risks, developing behavior change skills, and increasing self-efficacy concerning undertaking risk reduction behaviors (Strecher, DeVellis, Becker, & Rosenstock, 1986) would seem appropriate. The lack of discussion about health topics, the low perceived support for health behavior change within the household, and the relatively high percentage of ethnic minorities suggest that there may be cultural values or patterns that act as obstacles to health behavior change. Additional research--such as focus groups or in-depth interviews--should be conducted to identify such cultural patterns. Intervention planners should also consider several other factors: relatively low education and income suggest that education should not rely heavily on reading matter, and focus on media that are relatively inexpensive and heavily used by the less affluent. An emphasis on social reinforcement in the community may also be called for: Given their low sense of efficacy, these individuals may be especially unable to withstand countervailing social pressures. Failed attempts to change may be especially damaging for this group, since such failures would reinforce their doubts concerning their capacity to change.

The younger Unhealthful Adults, in contrast, do not report

much concern about their health and are unwilling to change their health habits despite recognition of their risk status. Their social environment, in which their peers also smoke and tend towards unhealthful diet habits, reinforce unhealthful patterns. Whereas confidence in one's capacity to change may be the primary focus for addressing the older adult cluster, motivation to change within an unhealthy social environment would be the focus when addressing the Unhealthful Adult cluster. Use of incentives and competitions packaged in such a way as to point out short-term benefits may be effective. Community or organization-based interventions attempting to influence group norms and values would also be appropriate. Focus groups and in-depth interviews might be used to identify possible motivators for this group which could be used in structuring education and intervention efforts.

The Unhealthful Young Adults, in turn, share the low levels of health knowledge of the Worried Older Adults, and the lack of interest in health change of the Unhealthful Adults. It might be that greater awareness of cardiovascular disease risks and of their preventability would increase willingness to change; however, it may be that interventions targeted to this segment should emphasize both education and altering home/community/organizational influences.

Another difficulty confronted by health professionals in reaching Unhealthful Adults, Worried Older Adults, and Unhealthful Young Adults is that these are the three clusters least likely to attend to health information. This difficulty can be compensated for to some extent by targeting health education efforts through mediated and interpersonal channels most attended to and trusted

by each of these groups. Clusters, such as the ones identified in this study, tend to have distinctive patterns of media use and interpersonal communication (Weinstein, 1987; Wells, 1974), and optimal channels can be identified with some confidence.[8]

The Healthful Adults pose a problem of a different sort to the intervention planner. They are a group familiar to many public health educators: knowledgeable, middle-aged, educated people, largely women, who are likely to make up the largest and most interested audience for an intervention effort (Lefebrve cite). Unfortunately, their interest and participation may have limited public health impact: their health habits are already relatively healthful. Intervention efforts, then, may easily draw participants and awareness from a sizable percentage of the population without having much impact on overall health behavior and health outcomes.

Each of the health-oriented clusters--including the relatively small Health Talkers and Young Athletes--may provide an important resource for the intervention planner. These clusters may provide volunteers, program promoters, and--given their relatively high education--serve as opinion leaders in a community. Health Talkers, in particular, seem to have a particular interest in health per se and might serve effectively as program volunteers and lay leaders. The Young Athletes are notable not only for their participation in vigorous exercize, but for the number of Hispanics and other minorities. As the only healthful group that has a sizable proportion of minority members, its members might serve as opinion leaders and role models among the minority community and among young people in

general.

One can only speculate as to the generalizability of the lifestyle patterns identified here to other populations or to a national sample. It would be useful to identify the variables and items used in this analysis that best discriminate clusters, and then develop a shorter, more cost-effective data collection instrument for use in other research and health education planning efforts. Even more useful, given the limited time and resources available to conduct most educations and intervention efforts, would be useful to conduct lifestyle analyses with a representative national sample--preferably oversampling minorities and high risk groups. The results of such analyses could provide health professionals with a guide to planning health education and promotion messages appropriate to various audience segments, selecting effective communication channels, and designing intervention strategies. It should be noted that different analyses would have to be conducted for domains of health behaviors having different sets of determinants. For example, lifestyle patterns related to cardiovascular disease risk factors might be only of limited utility in the context of AIDS prevention.

Whether for CVD, AIDs, or other lifestyle-related ills, lifestyle segmentation combined with a social marketing perspective can improve our understanding of target audiences and increase our ability to design and implement health interventions. Such interventions are more likely to be sensitive to the needs and values of the targeted populations and more effective in bringing about change.

Notes

1. The research reported in this paper was conducted with the support of Public Health Service Grant HL21906 from the National Heart, Lung, and Blood Institute to John W. Farquhar, M.D., principal investigator. An earlier version of this paper was presented to the annual conference of the American Public Health Association, New Orleans, LA, October 1987. The authors gratefully acknowledge comments and suggestions by David Altman, Donald Barrett, Nathan Maccoby, Edward Maibach, and Marilyn Winkleby of the Stanford Center for Research in Disease Prevention, and David Jacobs of the University of Minnesota.

2. To whom reprint requests should be addressed.

3. See for a full discussion of the literature review, variables identified, and the health behavior determinant model used. The paper is available from the authors.

4. The specific items used to operationalize all variables described in this paper are available from the authors.

5. An alternate method sometimes used is the holdout sample: comparing the results of cluster analyses using the same algorithm on two subsets of the same data set. As Aldenderfer & Blashfield (1984) point out, this method provides no convincing evidence concerning validity.

6. When sample sizes in each group are unequal, as they are here, alpha levels associated with MANOVA test statistics are inexact. This inexactness is not of serious concern here, given the high significance levels obtained. These MANOVAs include only those respondents who participated in the follow-up survey.

7. Self-reported exercise change, both moderate and vigorous, and self-reported health maintenance behavior

improvements were measured two years after the baseline survey, during which time education efforts had begun in two of the four cities surveyed. However, residence in a treatment community when included as a control had no significant impact on the effect size for cluster for these criterion variables, nor was there a significant treatment by cluster interaction.

8. Data analysis reported in M.D.,"Channel Analysis in Health Promotion Efforts," manuscript in preparation.

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Table 1. Demographic Characteristics of Baseline Survey Respondents.

Variable	Mean or percentage of total sample	Range
Age in years	36.6	12-75
Years education	12.6	0-27
Household income ($M/yr)	19.5[a]	less than 5-greater than 100
Household size	3.2	1-12
% female	52.6	
% married	54.5	
% white	82.7	
% Hispanic	9.6	
% Asian	2.6	
% black	1.5	
% smokers	28.1[b]	

[a]Approximated from a mean score of 4.45: 4-$15,000-$19,999, 5-$20,000-$24,999.

[b]Respondents were coded as smokers if they report smoking one or more cigarettes on a typical day.

Table 2. Adult Lifestyle Clusters.

Variables:	Clusters:			
	Healthful Adults (n=645)	Unhealthful Adults (n=533)	Worried Older Adults (n=399)	Healthful Talkers (n=92)
Age (yrs):	48	35	52	34
Income (,000):	24	21	16	24
Education (yrs):	14	13	11	14
HH size:	2.7	3.3	2.8	3.2
% female:	70	40	59	50
% married:	81	59	77	63
% white:	93	85	74	85
% Hispanic:	--	9	14	7
% Asian:	2	--	--	--
Healthful diet:	.57	-.38	-.29	.36
High exercise:	-.34	--	-.40	.34
Walking:	.37	--	-.29	.25
Non-smoking:	.34	-1.20	--	--
Non-drinking:	--	-.51	.31	--
Discussion:	--	--	-.41	3.35
Peer diets:	.34	-.36	--	--
Peers not smoking:	.26	-.77	--	--
HH support:	.43	--	-.71	--
Perceived risk:	--	.44	.36	--
Health worry:	-.32	--	.37	--
Will change:	.32	-.44	--	--
CVD preventable:	.49	--	-.38	.44
Knowledge:	--	--	-.34	.40
CVD salient:	--	--	.58	--
Weight as risk:	.33	--	.32	--
Healthy foods:	.42	--	-1.00	--
Can change diet:	.47	-.43	--	.32
Can exercise:	--	--	-.68	.26

Note. Values indicated for demographic variables are cluster means or percentages, as indicated. Numbers for all other items are mean z-scores for the cluster. Behavior, social influence, and attitude/cognition variables are reported only if the z-scores were greater than .25 or less than -.25, and were significantly different from the sample mean at $p<.001$. For behaviors and social influences, a positive z-score indicates a healthful orientation, a negative z-score an unhealthful orientation. For attitudes/cognitions, a positive z-score indicates a mean in the direction suggested by the variable label in the table. Ethnic percentage is reported only if 2% or greater.

Table 3. Young Adult Lifestyle Clusters.

Variables:	Clusters:		
	Healthful Young Adults (n=426)	Unhealthful Young Adults (n=336)	Young Athletes (n=71)
Age (yrs):	24	20	20
Income (,000):	12	17	25
Education (yrs):	14	9	10
HH size:	2.7	5	4
% female:	27	57	25
% married:	20	21	18
% white:	91	62	69
% Hispanic:	3	27	18
% Asian:	--	--	6
Healthful diet:	.31	-.58	--
High exercise:	.52		3.54
Walking:	.31	-.58	--
Non-smoking:	.43	.42	.31
Non-drinking:	--	.83	--
Discussion:	--	-.41	--
Peers not smoking:	.37	--	.50
HH support:	.36	-.29	--
Perceived risk:	-.42	-.39	-.39
Health worry:	.29	--	.63
Will change:	.30	-.30	--
CVD preventable:	.34	-.76	--
Knowledge:	.29	-.25	--
CVD salient:	-.28	-.32	--
Weight as risk:	--	-.60	--
Healthy foods:	.47	--	.36
Can change diet:	.32	--	--
Can exercise:	.68	--	.89

Note. Values indicated for demographic variables are cluster means or percentages, as indicated. Numbers for all other items are mean z-scores for the cluster. Behavior, social influence, and attitude/cognition variables are reported only if the z-scores were greater than .25 or less than -.25, and were significantly different from the sample mean at $p<.001$. For behaviors and social influences, a positive z-score indicates a healthful orientation, a negative z-score an unhealthful orientation. For attitudes/cognitions, a positive z-score indicates a mean in the direction suggested by the variable label in the table. Ethnic percentage is reported only if 2% or greater.

Table 4. Planned Contrasts to Test Predictive and Construct Validity of Clusters.

Table 4. Planned contrasts testing predictive and construct validity of clusters.

Dependent Variable	Overall F-ratio	Contrasts		
		Health Orientation[b]	Adults[c]	Youth[d]
All[a]	6.93***	13.57***	10.69***	8.35***
(df)	(36,7003)	(6,1594)	(6,1594)	(6,1594)
Cross-sectional:				
Seatbelt Use	5.14***	20.11***	14.81***	3.86*
	(6,2492)	(1,2492)	(1,2492)	(1,2492)
Vitamin C Use	10.11***	16.90***	30.84***	7.97**
	(6,2497)	(1,2497)	(1,2497)	(1,2497)
Information Use	17.92***	50.81***	48.15***	15.14***
	(6,2409)	(1,2409)	(1,2409)	(1,2409)
Longitudinal:				
Moderate Exercise	7.81***	5.78*	.01	1.86
	(6,1629)	(1,1629)	(1,1629)	(1,1629)
Vigorous Exercise	10.78***	16.29***	.03	.03
	(6,1629)	(1,1629)	(1,1629)	(1,1629)
Behavior Changes	10.19***	30.78***	13.45***	28.56***
	(6,1629)	(1,1629)	(1,1629)	(1,1629)

Note. Numbers in parentheses are degrees of freedom. Each analysis includes all respondents to that item in each wave. Longitudinal items were asked two years after the baseline survey.

[a]Multivariate analysis of variance, see text.

[b]Planned contrast: health-oriented versus not health-oriented clusters.

[c]Planned contrast: Healthful Adults versus Unhealthful Adults.

[d]Planned contrast: Healthful Young Adults versus Unhealthful Young Adults.

***$p<.001$
**$p<.01$
*$p<.05$